REMARKS

Applicants respectfully request reconsideration of this application as amended. Claims 1-8, 10-12, 14, 15, 18, 20-22, 24, 25, 27, 28, 30, 31, 33, 34, 37, 38, 40, 41, 43-46, 48, 49, 51, 52, 55, 56 and 58-62 are pending in the application. Claims 3-5, 7, 11, 24, 30, 37, 40, 48, 55 and 60 have been amended. No claims have been added. No claims have been canceled.

The Examiner has rejected claims 3-5 under 35 U.S.C. §112, second paragraph, for failing to provide proper antecedent basis. In particular, the Examiner cites the limitation "the noise reduced third image" as lacking sufficient antecedent basis. Applicants have amended claims 3-5 to place the claims in better form for allowance. Applicants respectfully request the examiner to withdraw the rejection.

Claims 1-62 stand rejected under 35 U.S.C. §103(a) as being unpatentable over "Distinguishing Photographs and Graphics on the World Wide Web", by Athisos (hereinafter "Athisos"), IEEE 1997, in view of U.S. Patent No. 5,491,627 of Zhang, et al. (hereinafter "Zhang"). Applicants submit that the present claims are patentable over Athisos in view of Zhang.

Athisos discloses an automated system that distinguishes photographs and graphics on the World Wide Web. Recognition tests are originated from statistical observations about the differences between computer-generated graphics and photographs that appear on the Web. Based on these observations, Athitsos creates image metrics, which are functions based on images. The image metrics are expressed in terms of real numbers, known as "metric scores". In order to achieve high recognition accuracy, Athitsos combines scores from several metrics.

Furthermore, the Athisos system uses learning to create decision trees, which specify how to combine the various metric scores of an image in order to classify it (Athitsos, page 11, col.1, lines 2-9, lines 13-19). Athitsos observes that graphics tend to have fewer colors than photographs. The score of the image for the prevalent color metric is the fraction of pixels that have that color. Photographs contain noise that causes even nearby pixels to have different colors (RGB values) (Athitsos, page 11, col. 2, lines 4-8), resulting in a lower color metric score for photographs as compared to graphics.

Claim 1 recites:

> A method to train image classification, comprising:
> measuring noise in a first image; and
> training a classification model from the noise to classify a second image as a natural image versus an artificial image from the noise.

Applicants submit that Ahtisos does not disclose <u>using noise itself</u> in order to train a classification model to classify an image as natural versus artificial. The Examiner admits as much, stating that Athisos "fails to disclose the training the model using noise." (Office Action dated 10/21/03, page 3, point 6, incorporated by reference into Final Office Action dated 5/21/04). However, the Examiner cites Zhang as teaching the feature of training the model using noise. (Id.)

Zhang discloses the detection of microcalcifications in digital mammograms. First, regions-of-interest (ROIs) are selected from digital mammograms using a well-known computer-aided diagnosis device (CAD). Then the ROIs are background trend corrected, optionally Fourier-transformed into the frequency domain, and then scaled for input into a neural network trained to detect microcalcifications. (Zhang abstract). Applicants submit that Zhang does not disclose or suggest the feature of claim 1 of using noise itself to train a classification model to classify an image as natural versus artificial.

The Examiner specifically cites col. 5, lines 9-20 of Zhang as disclosing using noise to train a classification model. (Office Action dated 10/21/03, page 3, point 6). As noted by Applicants in the previous response filed 2/25/04, this portion of Zhang refers to a well-known CAD device for initial selection of ROI from digital mammogram. This device, described in detail in U.S. Patent No. 4,907,156 by Doi et al. (hereafter "Doi"), processes a digital X-ray image to obtain signal-enhanced image data with a maximum signal-to-noise ratio, and signal-suppressed image data with a suppressed signal-to-noise ratio. Then, the device forms a difference image by subtraction of the signal-suppressed image from the signal-enhanced image <u>to remove anatomic structured background and to enhance the visibility of regions-of-interest</u>. This difference image is input to a feature extraction device that <u>merely extracts the features characterizing abnormal anatomic regions, such as circularity and size,</u> ***and does not extract a noise as a feature***, to select ROIs (Doi, col.3, lines 33-35). Since Zhang merely utilizes a CAD device for initial selection of the ROIs and this device does not extract noise as a feature, Zhang does not disclose training the model using noise to classify a second image as a natural image versus an artificial image from the noise, as recited in claim 1. That is, Zhang does not set forth a classification model trained with noise. The Final Office Action and the previous Office Action dated 10/21/03 provide little explanation as to how Zhang discloses using noise to train a classification model to classify an image as natural versus artificial, and Applicants maintain that Zhang does not disclose or suggest such a feature.

As discussed above, Athisos does not disclose or suggest <u>using noise itself</u> in order to train a classification model to classify an image as natural versus artificial. Since neither Athisos nor Zhang disclose or suggest using noise itself in order to train a classification model to classify an image as natural versus artificial, any combination of Athisos and Zhang would also not disclose or suggest such a feature. As such, claim 1 is patentable over Athisos in view of Zhang.

Claims 2-6 depend from claim 1 and include additional limitations. Therefore, claims 2-6 are also patentable over Athisos in view of Zhang.

Claim 7 recites training a classification model from a feature vector, the feature vector including at least one feature of an image selected from the group of at least one text block feature, at least one edge-location feature, and at least one aspect ratio of an image. Athitsos' method distinguishes photographs from graphics by using a number of metrics. Zhang uses features to select the ROIs on the X-ray images. However, as discussed above, Athitsos and Zhang, taken alone or in combination, do not teach or suggest distinguishing a slide image from a comic image by generating the feature vector that comprises at least one feature of an image selected from the group consisting of at least one text block feature of the image, at least one edge-location feature of the image, and at least one aspect ratio of the image.

The Examiner cites Athisos at page 12, section 4, and at page 11, column 2, as disclosing the feature vector as an edge feature of the image. (Final Office Action at page 3, point 5). But those cited portions of Athisos only disclose using edges as a point of reference for color changes. In other words, color transitions in graphics versus photographs are much sharper at the edges, and Athiosos uses that color variation to classify an image. In contrast, the edge-location feature vector in amended claim 7 refers to the *location* of edges within an image, not to the colors surrounding the edges. (See specification at page 10, lines 19-28). Thus, Applicants respectfully submit that claim 7 is patentable over Athitsos in view of Zhang.

Claims 8 and 10 depend from claim 7 and include additional limitations. Therefore, claims 8 and 10 are also patentable over Athitsos in view of Zhang.

Amended independent claims 11, 24, 30, 37, 40, 48, and 55 and their corresponding dependent claims 10, 12, 25, 31, 38, 41, 49, and 56 include language that is similar to the language of amended claim 7, namely that the feature vector comprises at least one feature of an

image selected from the group consisting of at least one text block feature of the image, at least one edge-location feature of the image, and at least one aspect ratio of the image, and that the feature vector is used to distinguish a slide image from a comic image. Thus, for the reasons discussed above with respect to claim 7, Applicants respectfully submit that claims 11, 24, 30, 37, 40, 48, and 55 and their correspondent dependent claims 12, 25, 31, 38, 41, 49, and 56, are also patentable over Athitsos in view of Zhang.

With respect to claim 14, Athitsos merely discloses the above-mentioned metrics to distinguish between photographs and graphics. Zhang's microcalcification detection system discloses a shift-invariant neural network to detect microcalcifications using the described-above CAD device to select ROIs. In contrast, the presently claimed invention discloses that a feature noise vector for a classification model is derived from the noise difference histogram. Such feature vectors such as the noise vector and/or sharpness vector are used to classify the image as natural or computer-generated. Neither Athitsos nor Zhang discloses creating a feature vector that includes one or more of a noise vector and a sharpness vector to distinguish a natural image from an artificial image, as recited in independent claim 14. Thus, Applicants respectfully submit that claim14 is patentable over Athitsos in view of Zhang.

Claim 15 depends from claim 14 and includes additional limitations. Therefore, claim 15 is also patentable over Athitsos in view of Zhang.

Independent claims 21, 27, 33, 43, 45, 51, and 58 and their corresponding dependent claims 22, 28, 34, 44, 46, 52, and 59-62, respectively, include features similar to those of claim 14. Specifically, these claims set forth generating a feature vector that includes one or more of a noise vector and a sharpness vector to distinguish a natural image from an artificial image. Thus, as discussed above with respect to claim 14, Applicants respectfully submit that claims 21, 27,

33, 43, 45, 51, 58 and their dependent claims 22, 28, 34, 44, 46, 52, 59-62, are patentable over Athitsos in view of Zhang.

With respect to claim 18, Athitsos merely discloses a method to distinguish between static photographs and graphics. Unlike the presently claimed invention, Athitsos' method does not disclose images that are frames in a video stream. The Examiner stated that Zhang teaches the video stream of data and referred to a mammogram as a video signal. (See Office Action dated 10/21/03, page 4). Yet, a mammogram is a *static* image of the object, whereas a frame in a video stream is part of a *dynamic* image. Thus, neither Athisos nor Zhang, taken alone or in combination, teaches or suggests the image classification system, wherein the image is a frame in a video stream, as recited in claim18. Hence, Applicants respectfully submit that claim 18 is patentable over Athitsos in view of Zhang.

Claim 20 depends from claim 18 and includes additional limitations. Therefore, claim 20 is also patentable over Athitsos in view of Zhang.

Applicants respectfully submit that the rejections have been overcome, and that the claims are in condition for allowance. Accordingly, applicants respectfully request the rejections be withdrawn and the claims be allowed.

The Examiner is requested to call the undersigned at (303) 740-1980 if there remains any issue with allowance of the case.

Applicants respectfully petition for an extension of time to respond to the Final Office Action pursuant to 37 C.F.R. § 1.136(a) should one be necessary. Please charge our Deposit Account No. 02-2666 to cover the necessary fee under 37 C.F.R. § 1.17(a) for such an extension.

Please charge any shortage to our Deposit Account No. 02-2666.

Respectfully submitted,

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I hereby certify that this correspondence is being deposited with the United States Postal Service as first class mail with sufficient postage in an envelope addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 on 10/22/04.

Leah Schwenke

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